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NEW SPECIES OF CALOCARIDIDAE FROM THE CARIBBEAN SEA AND GULF OF MEXICO (CRUSTACEA: DECAPODA: THALASSINIDEA)

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ABSTRACT

Three new species of deepwater calocaridid shrimps are recorded from the Gulf of Mexico: *Calastacus colpos, Calastacus mexicanus,* and *Calocaris caribbaeus.* The latter species is also recorded from several sites in the Caribbean Sea. *Calastacus colpos* is characterised by flattened contiguous eyes, a single spine on the dorsal margin of the merus of pereopod 1, and 3–4 spines on the uropodal suture. *Calastacus mexicanus* is characterised by rounded non-contiguous eyes, strongly spinose merus and carpus of pereopod 1, and 8–9 spines on the uropodal suture. *Calocaris caribbaeus* is similar to the north-east Atlantic *C. templemani* Squires, but differs in having weaker spination of the uropod and telson.

Calocaridid shrimps are generally deepwater benthic burrowing forms, which probably in part accounts for the relatively few species known. This deepwater habit is reflected in the usually modified eye structure with reduced pigmentation, and may also have provided the impetus for most members of the family to be hermaphroditic.

Calocaridids have not previously been recorded from the Gulf of Mexico and the Caribbean Sea. The material described here has accumulated in the collections of the National Museum of Natural History, Smithsonian Institution, from several sources, including collections made by the University of Miami's research vessel JOHN ELLIOT PILLSBURY, the National Marine Fisheries vessel *Oregon,* and the Texas A&M University's oceanographic surveys in the Gulf of Mexico.

Abbreviations: cl—carapace length; NGOMCS—Northern Gulf of Mexico Continental Shelf Study; USNM—National Museum of Natural History, Smithsonian Institution.

SYSTEMATICS

Family Calocarididae Ortmann, 1891

Remarks.—The family Calocarididae was rediagnosed, and a key to four genera was provided by Kensley (1989). One of these genera, *Callistocaris* Kensley [December] 1989, is a junior synonym of *Ambiaxius* Sakai and de Saint Laurent, [October] 1989. Sakai (1991) then designated the genus *Paracalocaris,* which was separated from *Lophaxius* Kensley, 1989, primarily on the latter having a subchelate pereopod 2. This is clearly an erroneous statement in the original diagnosis of *Lophiaxius,* which has the typical chelate second pereopod of the calocaridids. *Paracalocaris* is thus regarded as a junior synonym of *Lophaxius.* Sakai (1992) added the genus *Eucalastacus,* which is more closely related to *Calocaris* than to *Calastacus,* being very similar in the structure of the eyes, pereopod 1, pleopods 1 and 2, and shape of the dentate rostrum. *Eucalastacus* differs from *Calocaris* only in the lack of a post-cervical median carina (not illustrated by Sakai (1992)). Poore (1994) provided a key to the families of the Thalassinidea, and to the genera of the Calocarididae. In the latter key, the character used to separate *Calastacus,* viz. pleopod 2 with appendix interna and appendix masculina free, is incorrect. The appendix interna in all four species of *Calastacus* is fused to the base of the appendix masculina.

Genus *Calastacus* Faxon, 1893

Calastacus colpos new species. North-west Gulf of Mexico, 339–1,171 m.
Calastacus laevis de Saint Laurent, 1972. Western Mediterranean, 950–1,000 m.
Calastacus mexicanus new species. Gulf of Mexico, 603–640 m.
Calastacus stilirostris Faxon, 1893. Pacific Mexico, 1,207 m; Bay of Panama, 1,098–1,200 m.

Calastacus colpos new species
Figures 1, 2

Material Examined.—Holotype, USNM 243393, Texas A&M 2-3265, cl 8.2 mm, north-west Gulf of Mexico, 27°17.5'N, 95°08.5'W, 1,098–1,171 m. *Paratypes,* USNM 243394, Texas A&M 2-3262, cl 10.4 mm, north-west Gulf of Mexico, 25°39.5'N, 95°49.5'W, 970 m.—USNM 243395, Texas A&M 2-3263, cl 8.9 mm (eggs visible inside carapace), north-west Gulf of Mexico, 27°44.9'N, 95°20.1'W, 339–384 m.—USNM 243396, cl 6.1 mm, Gulf of Mexico, 494 m, 6 Aug 1987.

Description.—Carapace (Fig. 1A, C) faintly rugose; rostrum spiciform, unarmed, reaching anteriorly to level of fourth antennal peduncular article; supra-orbital spines directed anterodorsally. Median carina weakly defined, with tubercle in anterior half; cervical groove dorsally strong, becoming obsolete anteroventrally; suprabranchial groove faint. Abdominal pleura (Fig. 1A) ventrally rounded, pleuron of abdominal somite 1 shortest, posteroventrally narrowed; pleuron 2 broadest. Telson (Fig. 1B) 1.6 times longer than greatest width, roughly rectangular in shape, with tiny mobile posterolateral spine; posterior margin gently convex.

Eyes with cornea flattened, contiguous along midline, lacking pigment. Antennular peduncle article 1 subequal in length to articles 2 and 3 combined. Antennal peduncle article 2 with slender distolateral spine; acicle slender, almost reaching base of article 5. Mandible (Fig. 1G) with blade-like part having low blunt distolateral apical prominence; molar on buccal surface broadly rounded; palp of 3 articles, distal article longest, with numerous short stiff setae on distolateral surface. Maxillule (Fig. 1E) with exopod of 2 articles, distal article tipped with 2 slender setae; endopod with setose broadly truncate mesial margin; endite about twice width of endopod, mesial margin densely setose. Maxilla (Fig. 1F) with scaphognathite bearing elongate spinulose whip; exopod distally slender, tapering.

Maxilliped 1 (Fig. 1D) having large bilobed epipod; exopod of 2 articles, basal article broad, gently curved, distal article digitiform, with 2 distal setae; endopod shorter and more slender than exopod, of 2 articles, distal article longer, digitiform, bearing single terminal seta. Maxilliped 2 (Fig. 2A) with epipod bearing small marginal hooks; well developed exopod distally flagelliform. Maxilliped 3 (Fig. 2B), posterior margin of ischium entire; merus with 2 spines posterodistally; ischial crest bearing about 20 denticles. Pereopod 1 (Fig. 2D), chelipeds subequal, similar; ischium with single distal spine on posterior margin; merus with single row of about 6 spines on posterior margin, single distal spine on anterior margin; carpus unarmed; propodal palm subequal in length to fingers, with single distal spine on upper margin; dactyl strongly downcurved; cutting edges of fingers faintly serrate. Pereopod 2 (Fig. 2E), articles setose, otherwise unarmed. Branchial formula as in *C. stilirostris* (Table 1). Pleopod 1 (Fig. 2C) distal article basally broadened, with longitudinal fold (perhaps indicating fused endopod and exopod) ending distally at slight emargination; basal mesial lobe bearing cluster of hooks (representing fused appendix interna). Pleopod 2 (Fig. 2F) exopod simple flagelliform; endopod bearing appendix masculina of 2 slender setose articles, distal article shorter, tapering; appendix interna fused basally with proximal article of appendix masculina. Lateral uropodal ramus (Fig. 1B) with 3 or 4 tiny spines along suture, larger articulating spine on outer margin; mesial ramus with 1 or 2 spines on outer margin.

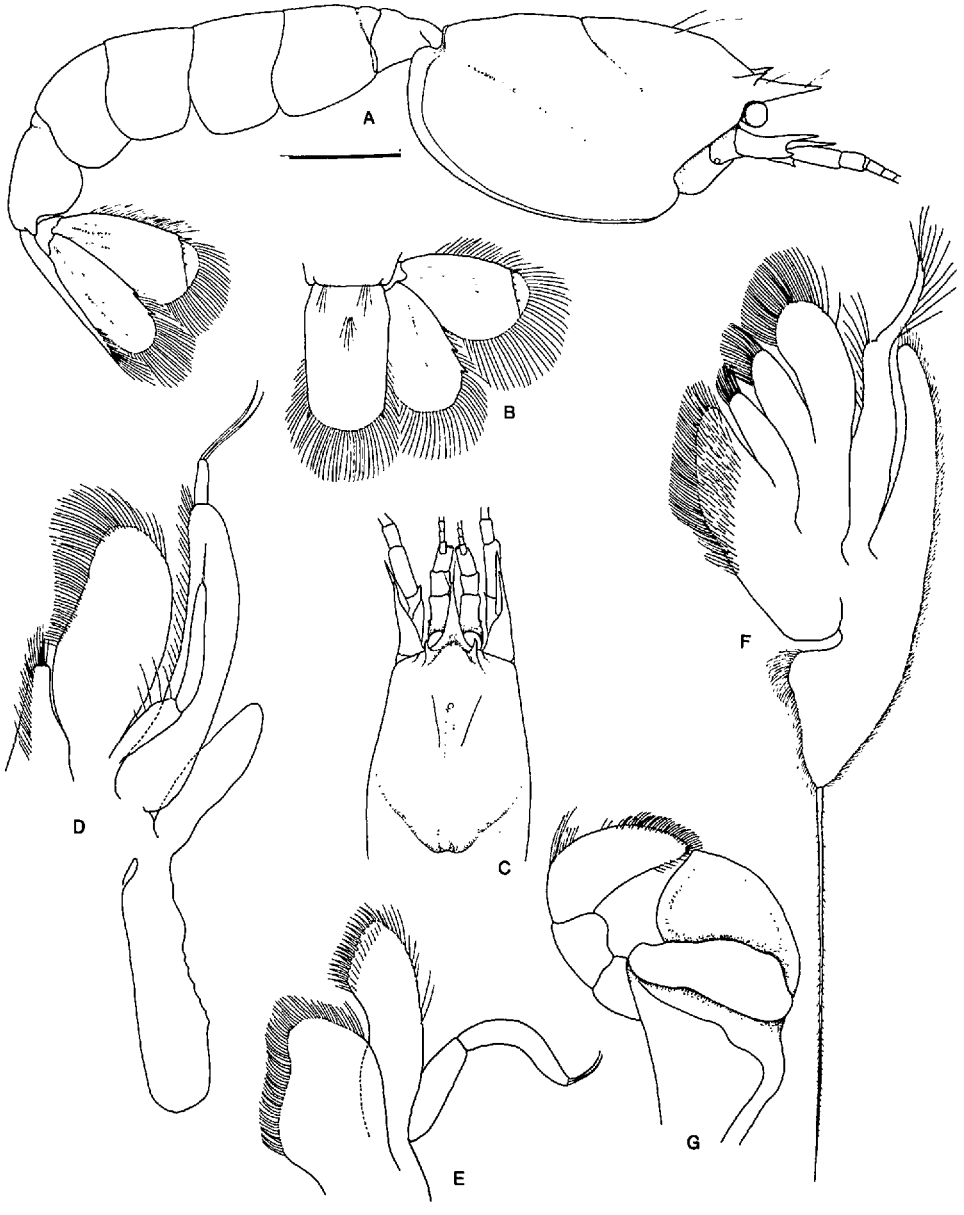

Figure 1. *Calastacus colpos.* A, Lateral view; B, Telson and right uropod; C, Anterior carapace in dorsal view; D, Maxilliped 1; E, Maxillule; F, Maxilla; G, Mandible in buccal view. Scale = 3 mm.

Remarks.—Calastacus colpos differs from *C. mexicanus,* the other new species from the Gulf of Mexico, in several easily detected features. These include the carapace (faintly rugose in *C. colpos,* dorsally feebly tuberculate in *C. mexicanus*), the relatively longer pair of spines on the posterior margin of the merus of the third maxillipeds, the much more spinose and robust first pereopods, and the more strongly spinose suture on the outer uropodal ramus, in *C. mexicanus.*

The four species of *Calastacus* can be distinguished by the features in Table 2. The character of eye shape requires some discussion, given that *C. colpos* and

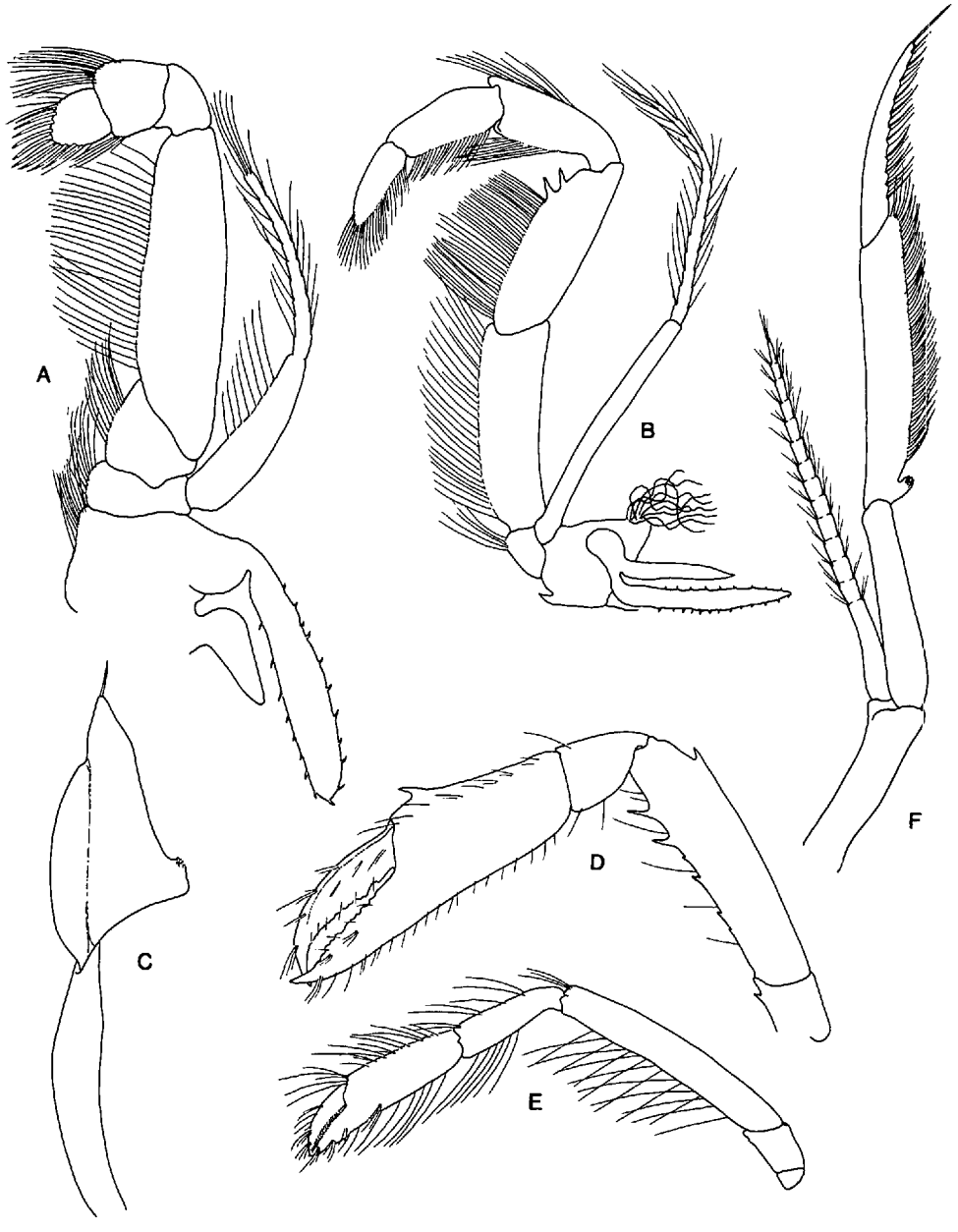

Figure 2. *Calastacus colpos.* A, Maxilliped 2; B, Maxilliped 3; C, Pleopod 1; D, Pereopod 1; E, Pereopod 2; F, Pleopod 2.

C. stilirostris have flattened corneas that are contiguous along the midline, while *C. laevis* and *C. mexicanus* have subspherical non-contiguous cornea. That flattening of the cornea and loss of corneal pigmentation are advanced characters (see Poore, 1994: 109) seems beyond dispute. The value of these characters in the case of *Calastacus,* however, must be questioned, given that the four species of the genus agree in so many other features, and especially in the structure of the first and second pleopods.

Table 1. Branchial and exopod formula for *Calastacus stilirostris*

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Exopod	1	1	1	—	—	—	—	—
Epipod	1	1	1	1	1	1	1	—
Podobranch	—	—	1	1	1	1	—	—
Arthrobranch	—	r	2	2	2	2	2	—
Pleurobranch	—	—	—	—	—	—	—	—
Setobranch	—	—	1	1	1	1	1	—

Etymology.—The specific name is derived from the Greek 'kolpos', a gulf, and refers to the Gulf of Mexico.

Calastacus mexicanus new species
Figures 3, 4

Material Examined.—Holotype, USNM 211496, cl 13.5 mm, NGOMCS sta E2E, Gulf of Mexico, 28°01′04″N, 85°39′38″W, 629 m, 16 May 1985. *Paratypes,* USNM 211497, cl 13.0 mm, NGOMCS sta E2D, Gulf of Mexico, 28°07′38″N, 85°51′36″W, 624–631 m, 16 May 1985.—USNM 211498, cl 13.1 mm, NGOMCS sta E2, Gulf of Mexico, 28°17′36″N, 86°14′48″W, 603–640 m, 16 Apr 1984.

Diagnosis.—Carapace (Figs. 3, 4A) smooth; rostrum spiciform, lacking lateral teeth; single strong supraocular spine; median carina unarmed but with blunt tubercle; few low rounded submedian tubercles anterior to cervical groove; submedian and lateral carina absent. Abdominal pleura (Fig. 3) 2–5 ventrally rounded.

Eye with non-pigmented cornea rounded, non-contiguous. Mouth-parts as in *C. colpos.*

Maxilliped 1 and 2 as in *C. colpos.* Maxilliped 3 (Fig. 4C), posterior margin of ischium entire, dentate crest having 14 denticles; merus with 2 strong posterodistal spines. Pereopod 1 (Fig. 3), chelipeds subequal, similar; ischium with 3 spines on posterior margin; merus with 6 strong spines on upper margin, irregular double row of about 16–18 spines on posterior margin; carpus with 4 or 5 spines on upper surface; propodal palm subequal to fingers in length, mesial and lateral surface of palm with scattered strong spines, fixed finger with few rounded tubercles proximally on outer surface, cutting edge with large rounded tubercles proximally, tubercles becoming smaller and more close-set distally; dactylus with

Table 2. Comparison of four species of *Calastacus*

	C. colpos	*C. laevis*	*C. mexicanus*	*C. stilirosris*
Eyes	flattened, contiguous	rounded, non-contiguous	rounded, non-contiguous	flattened, contiguous
Pereopod 1				
Dorsal margin of merus	1 spine	1 spine	6 spines	1 spine
Dorsal margin of carpus	unarmed	unarmed	3 spines	unarmed
Lateral surface of propodus	unarmed	unarmed	spinose	spinose
Uropodal mesial ramus	2 spines	1 spine	unarmed	2 spines
Uropodal lateral ramus suture spines	3–4	7–9	8–9	7–9

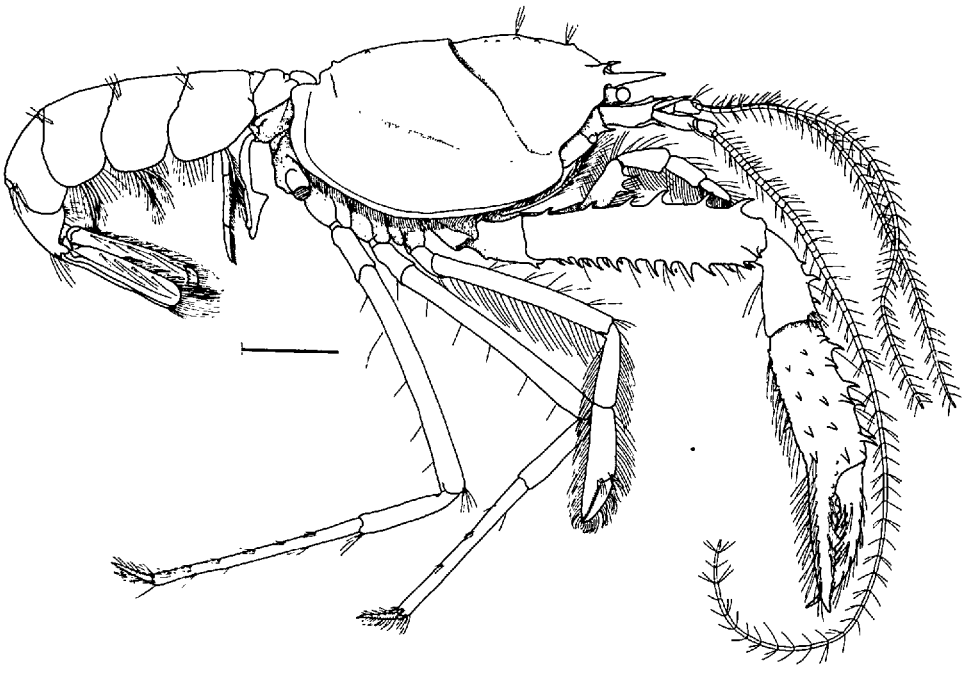

Figure 3. *Calastacus mexicanus,* holotype in lateral view. Scale = 4 mm.

cutting edge entire and sinuous proximally, distally denticulate. Pereopod 2 (Fig. 3), articles setose, unarmed. Branchial formula as in *C. stilirostris* (Table 1). Pleopod 1 (Fig. 4D), distal article basally broadened with hooks on mesial lobe (fused appendix interna); longitudinal fold ending distally in bilobed distal margin bearing single seta. Pleopod 2 (Fig. 4E), exopod simple, flagelliform; endopod bearing appendix masculina of 2 slender setose articles, distal article shorter, tapering; appendix interna fused basally with basal appendix masculina article. Lateral uropodal ramus (Fig. 4B) with lateral margin having single spine at suture, single submarginal mobile spine, 8–9 spines along suture; mesial ramus lacking marginal spines. Telson (Fig. 4B) with small posterolateral mobile spine, lacking dorsal spines spines.

Etymology.—The specific name refers to the type locality, the Gulf of Mexico.

Genus *Calocaris* Bell, 1853

Calocaris barnardi Stebbing, 1914. Off Saldanha Bay, South Africa, 89–180 m. Off Namibia, 338 m.
Calocaris caribbeaus, new species. Caribbean, 589–1,272 m; off Surinam, 1,042–1,070 m; off Trinidad, 878–942 m; Gulf of Mexico, 589 m.
Calocaris granulosus Grebenyuk, 1975. Gulf of Alaska, 756–1,000 m.
Calocaris isochela Zarenkov, 1989. New Zealand Plateau, 570 m.
Calocaris macandreae Bell, 1853. Mediterranean; North-east Atlantic, 25–1,072 m.
Calocaris sp., Indian 'form' of *macandreae* (Alcock, 1901): Bay of Bengal, 1,165–1,464 m; Arabian Sea, 1,163 m.
Calocaris templemani Squires, 1965. Northwest Atlantic from Newfoundland, Gulf of Maine, to North Carolina, 200–785 m.

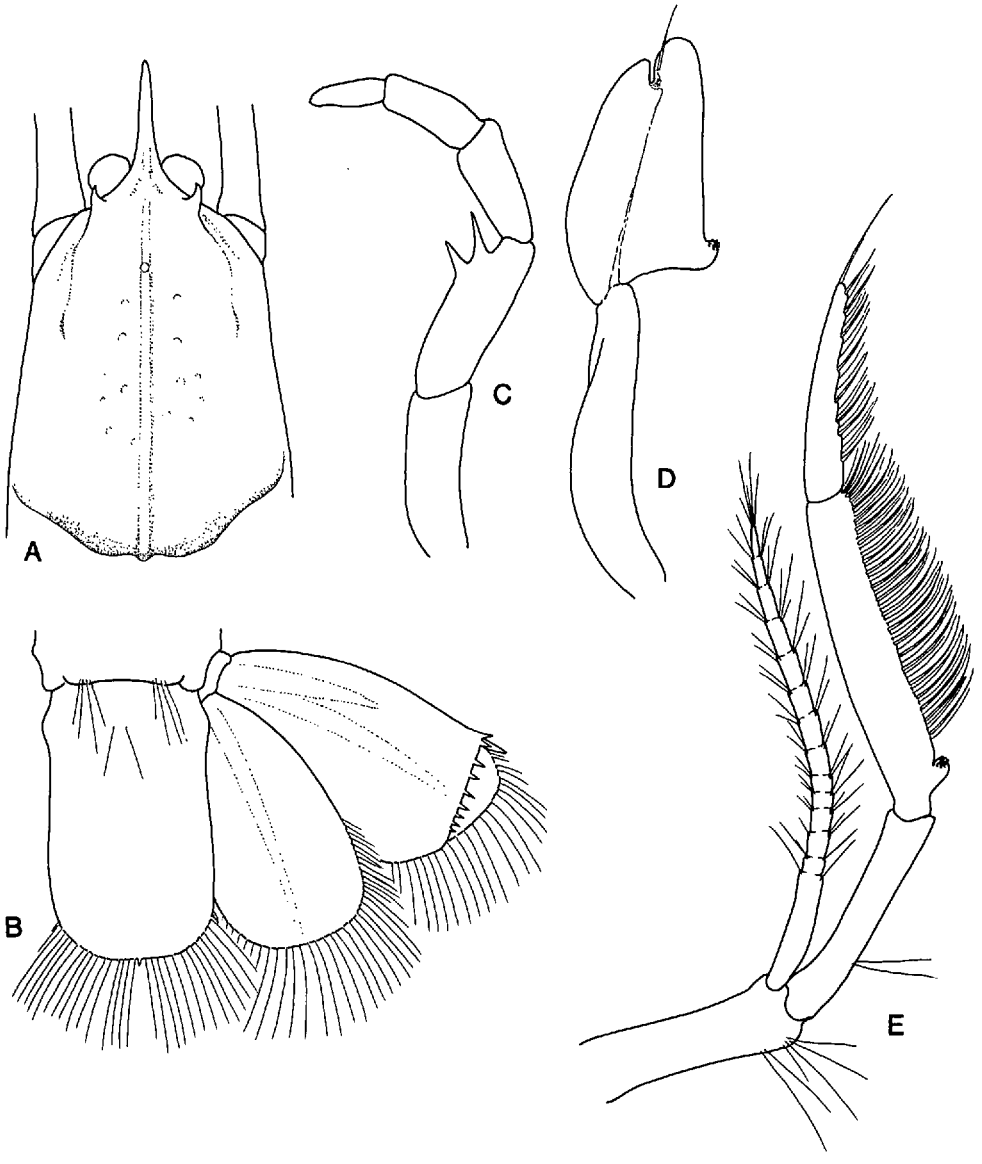

Figure 4. *Calastacus mexicanus.* A, Anterior carapace in dorsal view; B, Telson and right uropod; C, Maxilliped 3; D, Pleopod 1; E, Pleopod 2.

Calocaris caribbaeus new species
Figures 5, 6

Material Examined.—Holotype, USNM 243417, cl 12.0 mm, OREGON sta 10843, Lesser Antilles off Antigua, 17°06′N, 62°17′W, 589 m. *Paratypes,* USNM 243418, 15 specimens, cl 10.0–11.9 mm, OREGON sta 10843, Lesser Antilles off Antigua, 17°06′N, 62°17′W, 589 m.

Additional Material.—USNM 243419, 6 specimens cl 9.6–11.8 mm, PILLSBURY sta 675, off Surinam, 8°26′N, 54°17′W, 1,235–1,272 m.—USNM 243420, 2 specimens cl 9.9–10.2 mm, PILLSBURY sta 673, off Surinam, 7°56.5′N, 54°39″W, 1,042–1,070 m.—USNM 243421, 2 specimens cl 8.9 mm (1 damaged), PILLSBURY sta 846, off Trinidad, 11°37.8′N, 60°37.4′W, 878–942 m.—USNM 243422, cl. 8.7 mm, north-west Gulf of Mexico, 27°55′N, 90°20′W, 589 m.

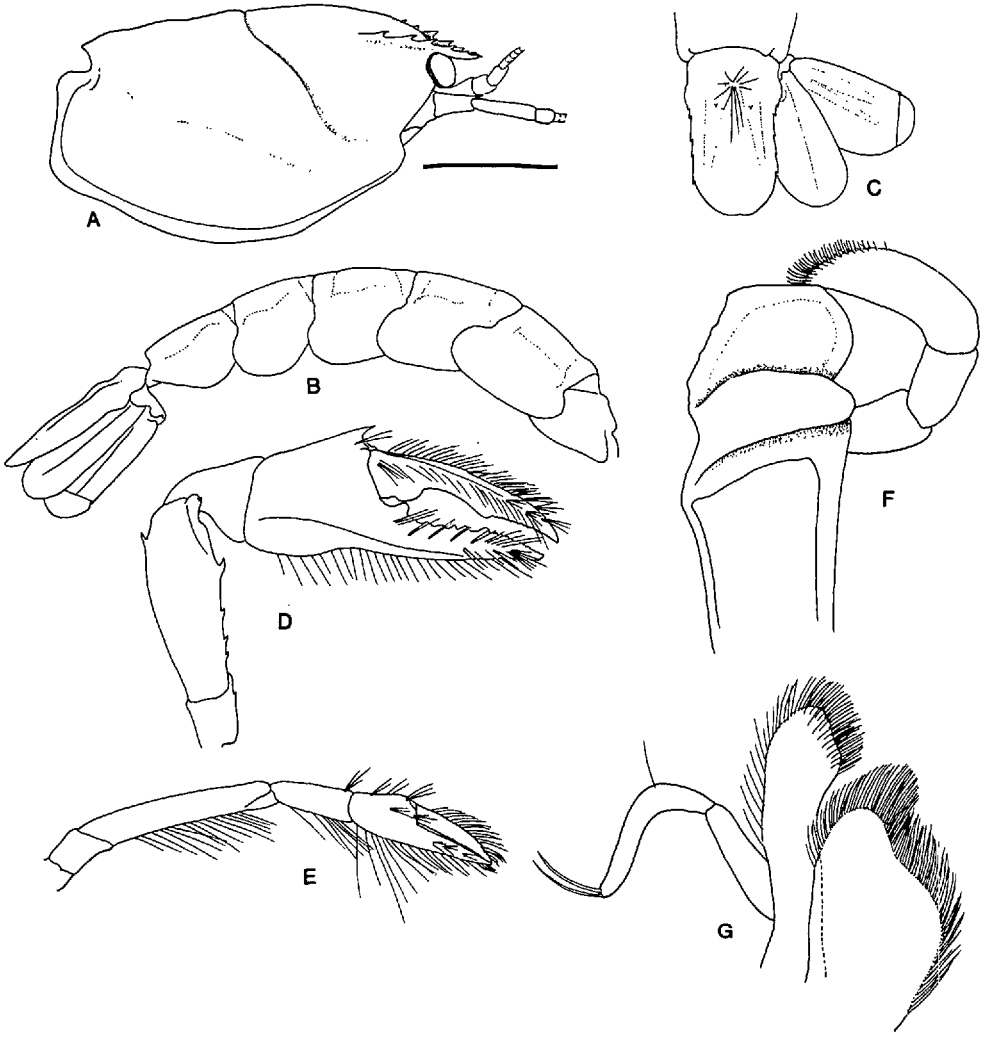

Figure 5. *Calocaris caribbaeus.* A, Carapace in lateral view; B, Abdomen and tailfan; C, Telson and right uropod; D, Pereopod 1; E, Pereopod 2; F, Mandible in buccal view; G, Maxillule. Scale = 5 mm.

Diagnosis.—Carapace (Fig. 5A) smooth. Rostral and postrostral spines in continuous series, 4–8 per side, (5 or 6 in 13 of 25 specimens). Abdominal pleura (Fig. 5B) ventrally rounded, lacking spines on anterior margins. Telson (Fig. 5C) with 0–4 tiny spines on submedian ridges (11 of 25 specimens having 1 spine per ridge); lateral margins bearing 0–6 tiny spines (21 of 25 specimens having fewer than 5 spines); posterior margin faintly bilobed.

Eyes unpigmented, corneas flattened, contiguous along midline. Antennular peduncle article 1 subequal in length to articles 2 and 3 together, with small tooth on lateral margin. Antennal peduncle article 3 with short distolateral tooth; acicle reduced to tiny rounded scale; article 4 three times length of article 5. Mandible (Fig. 5F) with broad incisor having 3 low cusps on mesial margin; molar on buccal surface transversely broadly rounded; palp of 3 articles, distal article longest, with numerous short stiff setae on distolateral surface. Maxillule (Fig. 5G)

Figure 6. *Calocaris caribbaeus*. A, Maxilla; B, Maxilliped 2; C, Maxilliped 1; D, Maxilliped 3; E, Pleopod 1; F, Pleopod 2; G, Pleopod 3.

Table 3. Branchial and exopod formula for *Calocaris caribbaeus*

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Exopod	1	1	1	—	—	—	—	—
Epipod	1	1	1	1	1	1	1	—
Podobranch	—	1	1	1	1	1	—	—
Arthrobranch	—	—	2	2	2	2	2	—
Pleurobranch	—	—	—	—	—	—	—	—
Setobranch	—	—	1	1	1	1	1	—

exopod of 2 articles, distal curved article with 2 terminal setae; endopod with setose broadly truncate mesial margin; endite about twice width of endopod, mesial and distal margins densely setose. Maxilla (Fig. 6A) with scaphognathite bearing elongate spinulose whip; exopod distally slender, tapering.

Maxilliped 1 (Fig. 6C) with large bilobed epipod; exopod of 2 articles, curved basal article about 6 times length of digitiform distal article, latter with 2 distal setae; endopod consisting of 2 slender articles, about half length of exopod. Maxilliped 2 (Fig. 6B) with well developed setose exopod; epipod with podobranch of single lamella. Maxilliped 3 (Fig. 6D), ischium unarmed on posterior margin, ischial crest having 9 denticles; merus with small single posterodistal tooth. Pereopod 1 (Fig. 5D), ischium with small distal spine on posterior margin; merus bearing 4 spines on posterior margin increasing in size distally, single distal spine on anterior margin; carpus unarmed; propodal palm two-thirds length of fingers, with strong distal carinate spine on anterior margin, strong ridge on lateral surface reaching onto fixed finger, latter with cutting edge bearing strong rounded tubercle proximally followed by 5 small rounded teeth, distal straight margin finely denticulate; dactylus, cutting edge with strong rounded proximal tubercle, well separated from low tubercle at about midlength, remainder of distal margin finely denticulate. Pereopod 2 (Fig. 5E), posterior margin of ischium and merus unarmed. Branchial formula given in Table 3. Pleopod 1 (Fig. 6E) of 2 articles, basal article widest at midlength; distal article distally broadened, distal margin a rounded lobe, with subapical patch of hooklets. Pleopod 2 (Fig. 6F), endopod of 2 articles with slender appendix interna articulating at base of second article; latter densely setose for proximal two-thirds, with regular marginal setae in distal third. Pleopods 3–5 (Fig. 6G), appendix interna articulating at proximal third of endopod. Lateral uropodal ramus with single immobile spine on lateral margin at articulation of transverse suture; mesial ramus lacking spines on lateral margin.

Remarks.—Just as *Calocaris templemani* Squires (occurring from Newfoundland to South Carolina) shows weaker spination of the uropods and telson than *C. macandreae* from the Mediterranean and northeast Atlantic, so *C. caribbeaus* shows weaker spination of the same parts than *C. templemani.* The reduced spination of the lateral margins of the uropodal rami and the lateral margins and dorsal ridges of the telson, along with the lack of spines on the anterior margins of the pleura, and lower number of rostral and postrostral spines, are the major differences that separate *C. templemani* from *C. caribbaeus,* two very similar species.

Etymology.—The specific epithet is derived from the Caribbean Sea, whence the majority of specimens were collected.

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